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NOTICE OF ALLOWANCE AND FEE(S) DUE

4955 7590 09/16/2008

WARE FRESSOLA VAN DER SLUYS & ADOLPHSON, LLP
BRADFORD GREEN, BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

EXAMINER

PEACE, RHONDA S

ART UNIT

PAPER NUMBER

2874

DATE MAILED: 09/16/2008

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/538,972 | 06/14/2005 | Tapani Levola | 915-005.168 | 9487 |

TITLE OF INVENTION: DIFFRACTIVE GRATING ELEMENT FOR BALANCING DIFFRACTION EFFICIENCY

| APPLN. TYPE | SMALL ENTITY | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE |
|----------------|--------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | NO | \$1440 | \$0 | \$1440 | \$1440 | 12/16/2008 |

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. **PROSECUTION ON THE MERITS IS CLOSED.** THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE** OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax **(571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

4955 7590 09/16/2008

WARE FRESSOLA VAN DER SLUYS & ADOLPHSON, LLP
BRADFORD GREEN, BUILDING 5
755 MAIN STREET, P O BOX 224
MONROE, CT 06468

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

| |
|--------------------|
| (Depositor's name) |
| (Signature) |
| (Date) |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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10/538,972 06/14/2005

Tapani Levola

915-005.168

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TITLE OF INVENTION: DIFFRACTIVE GRATING ELEMENT FOR BALANCING DIFFRACTION EFFICIENCY

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| EXAMINER | ART UNIT | CLASS-SUBCLASS |
|-----------------|----------|----------------|
| PEACE, RHONDA S | 2874 | 385-037000 |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a **Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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MONROE, CT 06468

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability**Application No.**

10/538,972

Examiner

Rhonda S. Peace

Applicant(s)

LEVOLA, TAPANI

Art Unit

2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the RCE filed 8/27/2008.
2. ☒ The allowed claim(s) is/are 1-8,12,13,15 and 16.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 8/27/2008
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date ____.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

/Rhonda S. Peace/
Examiner, Art Unit 2874

/Michelle R. Connelly-Cushwa/
Primary Examiner, Art Unit 2874

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 8/27/2008 has been entered.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 8/27/2008 was filed in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Specification

The amendment to the specification filed 7/16/2008 is proper and has been entered into the record.

Allowable Subject Matter

Claims 1-8, 12, 13, 15 and 16 are allowed.

The following is an examiner's statement of reasons for allowance:

With regard to claims 1-8, the most applicable prior art does not disclose or reasonably suggest a virtual display device comprising an imager for providing an image light wave, a diffractive grating element responsive to said image light wave for

enlarging an exit pupil of said virtual image display device for displaying said image light wave as graphics. Said diffraction grating comprises a waveguiding substrate and is arranged to interact with said image light wave in order to couple energy from said image light wave into said substrate to form at least one diffracted image light wave propagating within said substrate in a direction of selected diffraction order. Moreover, said diffraction grating comprises at least two different grating regions having different properties and arranged on opposite sides with respect to a transition point, wherein diffractions generated by said at least two diffraction grating regions are arranged to mutually compensate for an effect of a variation in input angle of said image light wave at a given point of the grating on a total diffraction efficiency of said at least one diffracted image light wave propagating within said substrate. The most applicable prior art of record, Yoshida et al (US 5101297) fails to disclose or reasonably suggest a diffraction element as recited above, wherein said element is utilized in conjunction with an imager as claimed above. The device of Yoshida et al is an optical coupler for coupling a light signal into a waveguiding substrate. However, Yoshida et al does not disclose or reasonably suggest said diffraction grating element for use within a display device as required by claim 1. Therefore, claims 1-8 are considered patentable over the prior art and therefore are in condition for allowance.

Pertaining to claims 12 and 13, the most applicable prior art does not disclose or reasonably suggest a device comprising a waveguiding substrate, an imager having a first location of an image point and a second location of an image point, input optics to direct light from said first location point towards said substrate to form a first incident

light wave and to direct light from said second location towards said substrate to form a second incident light wave, and a diffraction grating element arranged to couple energy of said first incident light wave into said substrate to form first diffracted light waves propagating within said substrate in a direction of a first selected order and to form second diffracted light waves propagating within said substrate in a direction of a second selected diffraction order. Moreover, said diffraction grating element is also arranged to couple energy of said second incident light into said substrate to form first diffracted light waves propagating within said substrate in a direction of said first selected order and to form second diffracted light waves propagating within said substrate in a direction of a second selected diffraction order. Furthermore, the said diffraction grating element comprises at least two different regions having different diffraction properties such that distribution of light between the direction of said first selected diffraction order and the direction of said second selected diffraction order is arranged to remain substantially the same when light is directed from said second location instead of light being directed from said first location. Finally, the input optics are further arranged to shift said second incident light wave on said diffraction grating element with respect to the said first incident light wave. The most applicable art, Nakanashi et al (US 2004/0233534), addressed in the Office Action mailed 8/23/2007, does not disclose an optical device as described above, such that the input optics are further arranged to shift said second incident light wave on said diffraction grating element with respect to the said first incident light wave in combination with the remaining limitations recited in claim 12. While the use of plural light sources would be

considered obvious in view of Nakanishi et al, Nakanashi et al does not disclose or suggest the lenses of Figure 21 shifting light from a second source, on said grating, with respect to light from the first source. Therefore, the current invention as described in independent claim 12 and dependent claim 13 is distinguished over the prior art, and is in condition for allowance.

Addressing claims 15 and 16, the most applicable prior art does not disclose or reasonably suggest an apparatus comprising a waveguiding substrate means, an imager means having a first location of an image point and a second location of an image point, input optics means to direct light from said first location point towards said substrate means to form a first incident light wave and to direct light from said second location towards said substrate to form a second incident light wave, and a diffraction grating means arranged to couple energy of said first incident light wave into said substrate means to form first diffracted light waves propagating within said substrate in a direction of a first selected order and to form second diffracted light waves propagating within said substrate means in a direction of a second selected diffraction order. Moreover, said diffraction grating means is also arranged to couple energy of said second incident light into said substrate means to form first diffracted light waves propagating within said substrate means in a direction of said first selected order and to form second diffracted light waves propagating within said substrate means in a direction of a second selected diffraction order. Furthermore, the said diffraction grating means comprises at least two different regions having different diffraction properties such that distribution of light between the direction of said first selected diffraction order

and the direction of said second selected diffraction order is arranged to remain substantially the same when light is directed from said second location instead of light being directed from said first location. Finally, the input optics are further arranged to shift said second incident light wave on said diffraction grating means with respect to the said first incident light wave. The most applicable art, Nakanashi et al (US 2004/0233534), addressed in the Office Action mailed 8/23/2007, does not disclose an optical device as described above, such that the input optics are further arranged to shift said second incident light wave on said diffraction grating element with respect to the said first incident light wave in combination with the remaining limitations recited in claim 12. While the use of plural light sources would be considered obvious in view of Nakanishi et al, Nakanashi et al does not disclose or suggest the lenses of Figure 21 shifting light from a second source, on said grating, with respect to light from the first source. Therefore, the current invention as described in independent claim 15 and dependent claim 16 are distinguished over the prior art, and is in condition for allowance.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571)272-8580. The examiner can normally be reached on M-F (8-5).

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rhonda S. Peace/

Examiner, Art Unit 2874

/Michelle R. Connelly-Cushwa/

Primary Examiner, Art Unit 2874